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The American STATISTICIAN

The news publication of the
AMERICAN STATISTICAL ASSOCIATION

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JUNE-JULY 1950
Volume 4, No. 3

25 CENTS

4 NEW BOOKS

in the Wiley Publications in Statistics

Walter A. Shewhart, Editor

An INTRODUCTION to PROBABILITY THEORY and ITS APPLICATIONS

Volume I. By WILLIAM FELLER, *Cornell University.* Serving a dual purpose, this book develops probability theory rigorously as a mathematical discipline and illustrates the great variety of practical problems with the modern technique used in their solution. The first volume is restricted to discrete sample spaces and random variables. *1950. 419 pages. $6.00.*

SOME THEORY of SAMPLING

By W. EDWARDS DEMING, *Bureau of the Budget and New York University.* This book provides the theoretical background plus the practical applications of modern statistical practice. Parts I, II, and III cover the problems which arise in planning surveys. Part IV gives a step-by-step summary of how the theory of sampling was applied to two real problems. Part V goes into advanced theory that can be used in the design and analysis of samples. *1950. 602 pages. Illus. $9.00.*

CONTRIBUTIONS to MATHEMATICAL STATISTICS

By RONALD A. FISHER, *University of Cambridge.* An unusual new book composed of 43 of the most important original papers in statistical research—chosen, collected, and annotated by the author especially for this volume. The papers cover a wide range of statistical interest, including the foundations of theoretical statistics, the logic of inductive inference, and the application of special methods in many fields, such as genetics and agriculture. *Ready in July. 656 pages. Prob. $7.00.*

EXPERIMENTAL DESIGNS

By WILLIAM G. COCHRAN, *The Johns Hopkins University,* and GERTRUDE M. COX, *University of North Carolina.* A full account of experimental design is presented in this new book. It explains the ways to plan and conduct comparative experiments so that they will provide specific answers to the scientific questions under investigation. Early chapters cover the logical principles that govern sound experimentation; later ones contain a detailed account of the experimental designs that have been developed. *1950. 454 pages. $5.75.*

Send for copies on approval.

JOHN WILEY & SONS, Inc.

440 Fourth Avenue New York 16, N. Y.

The American STATISTICIAN

JUNE-JULY 1950, VOL. IV, NO. 3

The news publication of the
American Statistical Association

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Entered as second class matter March 11, 1938, at the post office at Washington, D. C., under act of March 3, 1897. *The American Statistician is published five times a year—February, April, June, October and December—by the American Statistical Association, Editorial Office: 1108 16th Street, N.W., Washington 6, D. C. Subscription rate: one dollar and fifty cents a year or twenty-five cents per copy.*

THE ROLE OF THE STATISTICIAN

The statistical profession in the Federal government service has recently been given the recognition which we in the American Statistical Association feel is well deserved. This recognition came with the awarding of three of the new 25 top classifications (GS-18) recently authorized by the Congress, to the Directors of three major statistical agencies of the Federal government. These awards were given to Roy V. Peel, Director of the Bureau of the Census; Mr. Ewan Clague, Commissioner of Labor Statistics; and Oris V. Wells, Chief, Bureau of Agricultural Economics.

In addition, the Civil Service Commission has granted to the Deputy Directors of these agencies, three of the 75 grade GS-17 jobs in the Federal service recently authorized by the Congress. The persons in these positions are A. Ross Eckler of the Bureau of the Census; Aryness Joy Wickens of the Bureau of Labor Statistics; and F. F. Elliott, Associate Chief of the Bureau of Agricultural Economics. This gives an indication that the secretaries of the various departments as well as the U. S. Civil Service Commission have, in authorizing these grades, recognized the services rendered by the statistical agencies.

It is to be hoped that the state and city governments and business and industry, will follow the lead of the Federal government in recognizing the strategic position of the statistician in furnishing advice and guidance in the collection, processing and interpretation of data. Particularly it is to be hoped that they will take advantage of the specialized training of the statistician by utilizing his skills in the planning stages of all investigations of a statistical nature.

SAMUEL WEISS
Secretary-Treasurer

NEWS

1950 Annual Meeting Notes—New Committee Appointments—Summer Seminars—Public Health Statistician Wanted in Detroit—Fall Meetings —New Publications

The National Science Foundation

After five years of delay, Congress has voted the National Science Foundation Act and it has been signed by President Truman. The objections originally raised by the President to the administrative provisions of the bill that he vetoed in 1947 are absent, and the Federal Bureau of Investigation is not required to judge the loyalty of the Foundation's employees.

The Foundation is to be governed by an unpaid board of 24 members to be recommended by scientific bodies and institutions of learning and to be appointed by the President. The Inter-Society Committee for a National Science Foundation, sponsored by the American Association for the Advancement of Science (of which the A.S.A. is a member), has participated in the nomination of the panel from which the President will select the board members.

Among other duties that it must perform, the governing board must sign contracts for research and grant scholarships and fellowships. It will be responsible for setting up the administrative machinery of the Foundation and establishing policies for its future operation. It is expected that after the first fiscal year the maximum annual appropriation for research work may not exceed 15 million dollars, though it is probable that other government agencies will allocate to the Foundation some of the funds that the individual agencies receive for purposes of scientific research.

New Director of U. S. Census Bureau

Roy Victor Peel has been appointed Director of the Bureau of the Census. Dr. Peel is a specialist in government and political science, who took his doctorate at the University of Chicago.

With the exception of a four-year leave during World War II, Dr. Peel has been a professor at New York University, the University of Rochester, and Indiana University. During World War II, he served as chief of the United States Information Service in Copenhagen.

ANNUAL MEETING NOTES

The 110th annual meeting of the Association will be held in Chicago at the Congress Hotel, December 27-29, 1950. The Chairman of the Program Committee is Mortimer Spiegelman, Metropolitan Life Insurance Company, 1 Madison Avenue, New York, New York. The Chairman of the local Committee on Arrangements is Leo J. O'Grady, 1208 W. Washington Street, Chicago, Illinois.

Graphic Presentation "Salon"

To encourage a wider exploration of graphic methods, especially to promote excellence in chart making, the Association is sponsoring a Graphics Competition for the next Annual Meeting. Displays of graphics have been a familiar feature of past meetings, but it is hoped by this competition to stimulate wider active participation, and perhaps to unfold to general view some new devices and techniques in a field in which interest is not always matched by skill and mastery.

The following rules will cover the Graphics Competition:

1. *Eligibility*—All members or organizations represented by members will be eligible to submit entries. Competitors may submit any number of entries, but the number to be exhibited will be determined by the Committee.

2. *Entries*—will be classified as follows:
   - Class 1. Mathematical charts or graphs
   - Class 2. Organization charts and similar schematic diagrams
   - Class 3. Pictorial charts and "pictograms"
   - Class 4. Statistical maps
   - Class 5. General (line charts, bar charts, etc.)

3. *Basis of Award*—Entries will be judged on the basis of criteria appropriate to their classification. The major criteria are: originality of graphic concept, utilization of graphic concept (extent of applicability), forcefulness and clarity in conveying information in graphic terms, design (composition and color) and drafting technique.

4. *Selection of Award Winners*—Awards will be made by a Committee of judges selected by the Chairman of the Association's Committee on Presentation. Award winners will be announced at the final general session at the Annual Meeting.

5. *Submission of Entries*—The following information should be included in each notice of submission of an entry:
   a. Name and address of participant
   b. Organization represented, if any
   c. Title of entry
   d. Dimensions, and other appropriate descriptive information

All interested members are urged to participate in the Graphics Competition and to communicate their intention to do so as soon as possible to: Chairman, Presentation Committee, American Statistical Association, 1108 16th Street, N.W., Washington 6, D. C.

Informal Gathering

The Program Committee is planning an informal party to which all members of the Association are invited. The party is planned for Wednesday, December 27, 8-10 p.m., at the Congress Hotel.

Presentation Clinic

A second Presentation Clinic will be held at the next Annual Meeting. Under the sponsorship of the Committee on Presentation, this clinic offers the assistance and counsel of a panel of clinicians who have had broad experience in almost every aspect of statistical presentation. The Clinic invites questions on text, tabular, or graphic problems, and on the broader problems that are not restricted to any one form of presentation. Send questions now to

Kenneth W. Haemer
American Telephone and Telegraph Co.
195 Broadway
New York, New York

New Committee Appointments

A Committee to review the Constitution of the Association has been appointed under the chairmanship of Clem C. Linnenberg, Jr. Members of the Committee are Theodore H. Brown, Merrill M. Flood and Millard Hastay. Members of the Association are invited to send their comments and suggestions concerning possible revisions of the Constitution to Dr. Clem C. Linnenberg, Jr., U. S. Bureau of the Budget, Washington 25 ,D. C.

Public Relations Committee ..... David E. Cohen

Committee on Committees ..... Albert Epstein

Detroit Public Health Statistician Wanted

The Detroit Civil Service Commission will announce shortly an examination for the position of Public Health Statistician. The occupant of this position will be responsible for vital statistics registration and statistical activities in connection with medical epedemiology and other public health studies of the Detroit Public Health Department. The starting salary will be $6,100 per year with annual increases to approximately $6,800. Applicants are required to have completed the requirements of a university of recognized standing for a graduate degree in public health statistics, and it is preferred that applicants have either a Doctor of Science degree in public health statistics or a Doctor of Public Health degree. Further information may be obtained from Ralph Mueller, Head Personnel Examiner, Examinations Division, City of Detroit, The Civil Service Commission, 15th Floor Water Board Building, 735 Randolph Street, Detroit 26, Michigan.

The XIVth International Congress of Sociology

The XIVth International Congress of Sociology will be held in Rome, Italy early in September, 1950. It is the first conference since World War II that will bring together sociologists from all parts of the world after an interval of more than ten years.

The XIVth Congress was originally planned for Bucharest in 1939 and the program planned for that session has been kept for the Rome meeting.

Subjects on the agenda are: the social units, the village, the town, the village and the town, the methods of sociology, the social research institutes, the teaching of sociology.

Several other subjects will be placed on the agenda, both to enlarge the discussion from the standpoint of sociological theories, and to bring students into closer touch with subjects of present interest. The following subjects, proposed and approved by the Organising Committee, have therefore been placed on the agenda in addition to the above: sociology in the ancient world, the sociology of primitive peoples with special reference to the causes of the extinction of isolated groups, the neo-organismic theory, economic pathology, social metabolism, the contribution made by the several countries to inventions and discoveries, the development of technology and its influence on social organization, public opinion, the state as a sociological concept, the plurality of juridical organs from the sociological standpoint, the evolution and involution of law, the sociology of criminality, games from the sociological standpoint, the social reaction of the two world wars with special reference to the displacement of population, the future dynamism of the population and its importance from the sociological standpoint, the sociology of prisoner-of-war camps.

Information about participation may be obtained from the President of the Organising Committee for the XIVth International Congress of Sociology, c/o the Societa Italiana di Sociologia, Via delle Terme di Diocleziano, N. 10, Rome, Italy.

Summer Seminar in Statistics
Storrs, Connecticut
August 7 — September, 1950

Informal discussions and colloquia on a very wide range of statistical topics are to be features of the Seminar to be held under auspices of the University of Connecticut, located at the village of Storrs.

The following institutions are represented by those on the Seminar's Executive Committee: Columbia, Cornell, Harvard, Johns Hopkins, Princeton, University of Connecticut, University of North Carolina, Yale, Connecticut Agricultural Experiment Station.

There is no requirement that attendance be for the entire four-week period.

Anyone interested in attending should write the Seminar's Executive Secretary: D. F. Votaw, Jr., 210 Leet Oliver Hall, Yale University, New Haven, Connecticut.

New course in schedule designing

American University is offering a new course in their statistical department, "Design of Schedules for Data Collection," for the summer evening session beginning June 12. This course will deal with statistical and social science criteria related to the design of forms used to collect information in fields of government, education and private industry.

U. N. Economic Fellowship Programme

The United Nations Department of Economic Affairs has arranged a programme of economic development fellowships and public administration fellowships and scholarships for training and study abroad during the year 1950. These fellowships are made available under a resolution making available "scholarships for junior civil servants of Member Governments to provide training in public administration in existing national or international institutions or agencies for a period of approximately one year and to assist the scholars in the preparation of plans of study and work assignments."

Seminar in Economic Mobilization Planning

Columbia University's Graduate School of Business has announced a seminar in economic mobilization planning. Ralph J. Watkins, Director of Research for Dun & Bradstreet, Inc., and former Director of the Office of Plans and Programs of the National Security Resources Board, conceived the plan for the seminar and is conducting the first year's program.

The objective of the seminar is to investigate economic and business problems involved in peacetime planning for effective mobilization of resources in the event of war. Areas to be covered include controls of materials, production, manpower and other resources; the design of price, rationing and fiscal controls; measurement of resources-requirements relationships and the design of allocation systems; stockpiling policies; analysis of economic vulnerability and the relocation of industries; coordination of resources planning with strategic planning.

Information about the seminar may be obtained from the Graduate School of Business, Columbia University, New York City.

Newark Public Library Publishes Monthly Note on Business Literature

The Business Library of the Public Library of Newark, New Jersey, publishes a monthly list of business book information sources culled from the review sections of periodicals in the field of economics, statistics, marketing, management, personnel, and general business. The Library has offered to make their note available to American Statistical Association members upon request. Anyone who wishes to receive one should write Marian C. Manley, Business Librarian, The Public Library, 34 Commerce Street, Newark 1, New Jersey.

YOU ARE INVITED TO THE MIDWEST CONFERENCE

AMERICAN STATISTICAL ASSOCIATION AT THE **UNIVERSITY OF MICHIGAN**

North Central Regional Meeting **Ann Arbor, Michigan June 23-24, 1950**

PRELIMINARY PROGRAM

FRIDAY LUNCH — 12:00 Noon

ADDRESS OF WELCOME	*Chairman:* DEAN R. A. STEVENSON School of Business Administration, University of Michigan
THE MIDWEST CONFERENCE	D. R. G. COWAN, *General Chairman,* Donald R. G. Cowan & Associates, Cleveland
20 YEARS OF CORPORATE GROWTH	O. W. BLACKETT, *Professor of Statistics,* University of Michigan

FRIDAY AFTERNOON — 2:30 P. M.

Chairman: HOWARD L. JONES

SAMPLING THE INDUSTRIAL MARKET	FRANCIS JURASCHEK, *Manager,* Commercial Research Division, Carnegie-Illinois Steel Corp., Pittsburgh
THE MEASUREMENT OF CONSUMERS' ECONOMIC OUTLOOK AND BUYING PLANS	JOHN B. LANSING, Survey Research Center, University of Michigan
MARKET RESEARCH IN ACTION AT GOODYEAR	R. E. DAVIS, *Manager,* Sales Research Department, Goodyear Tire & Rubber Company, Akron
ROUND TABLE CENSUS DATA	Discussion led by HOWARD W. GREEN, Real Property Inventory, Cleveland

FRIDAY DINNER — 6:30 P. M.

Chairman: ANDREW T. COURT, *General Motor Corporation*

BUSINESS OUTLOOK	GARFIELD V. COX, *Dean,* School of Business, University of Chicago

FRIDAY EVENING — 8:30 P. M.

Chairman: LEO M. WELSH, *Proctor & Gamble Co.*

THE USE OF DISPOSABLE INCOME AND CYCLES IN FORECASTING SALES	HARRY MARSH, Harry Marsh and Associates, Hagerstown, Indiana

SATURDAY MORNING — 9:00 A. M.

Chairman: I. M. BURR, *Purdue University*

SOME APPLICATIONS OF STATISTICS IN THE STEEL INDUSTRY	W. R. WEAVER, *Director,* Steel Conservation and Quality Control, Republic Steel Corporation, Cleveland
APPLICATION OF STATISTICS IN THE LAMP DEPARTMENT, GENERAL ELECTRIC	WENDELL ABBOTT, *Head of Statistical Division,* Lamp Department, General Electric Company, Cleveland, Ohio

SATURDAY — 11:15 A. M.

APPLICATION OF STATISTICS IN CONTROLLING QUALITY IN THE FORD MOTOR COMPANY	GEORGE J. SCRANTON, *Manager,* Office of Quality Control, Ford Motor Company
ROUND TABLE: THE CONSTRUCTION OUTLOOK	ALAN C. WILLIAMS, Chicago Housing Authority, Chicago
FACTORS IN JUDGING THE THE AUTOMOBILE OUTLOOK	GEORGE P. HITCHINGS, *Manager,* Economic Analysis Department, Ford Motor Company
THE CREDIT SITUATION	MERLE HOSTETLER, *Manager,* Research Department, Federal Reserve Bank of Cleveland

SATURDAY LUNCH — 12:30 P. M.

Chairman: PROFESSOR S. S. WILKS

Princeton University; President, American Statistical Association

APPLICATION OF STATISTICS TO AGRICULTURAL RAW MATERIALS	R. W. LONGSTREET, Longstreet-Abbott & Company, St. Louis
FORECASTING IN AMERICAN BUSINESS	FRANK NEWBURY, Pittsburgh

AFTER LUNCHEON

ORGANIZATION MEETING	Detroit Chapter

REGISTRATION AND ACCOMMODATIONS

Registration 9:00 A.M. to 11:45 A.M. in the lobby of the School of Business Administration.
Registration fee, $1.00.

Rates for meals:
Luncheon, $1.50
Dinner, $2.50

Rates for accommodations:
Dormitory (men only)—Single, $2.00 per person
Double, $1.50 per person

Michigan Union—Single, $3.00 and $4.00
Double, $4.50 to $6.00

CHAIRMEN:
Program—DAVID C. ELLIOTT, *Economist,*
Arrangements—PROFESSOR OLEN BLACKETT,
EDWARD A. STEPHEN, *Statistician,*
General—DONALD R. G. COWAN, *Economist,*

U. N. Statistical Consulting Programme

The United Nations has been providing statistical consulting services to a number of countries. Advice on population census problems was the principal activity in 1949 because of the forthcoming national censuses of 1950 and 1951 and was given to Bolivia, Chile, Ecuador, Guatemala, Iran, Paraguay, Peru and Uruguay. These activities extended from a week in some cases, to several months in others. In addition, a statistical expert was sent to Burma to assist in organizing economic statistics.

Plans for 1950 include the continuance of the organizational work in Burma, and similar work in Thailand and Pakistan. Further attention will also be given to final plans for population censuses especially in Ecuador, Paraguay and Bolivia. Arrangements have been completed for a national income expert to spend two months in Brazil.

A number of other requests have been received from countries in the Middle East, Latin America and the Far East and arrangements are being made as rapidly as possible to respond to them. The present plans involve one expert statistical consultant, attached to the Statistical Office, to be generally available in each of the areas mentioned above. These activities will be supplemented as necessary and as additional funds are available.

The subjects covered by the consulting programme include:

(a) Organization and operation of centralized and decentralized statistical services.

(b) Statistical operations (collection, compilation, and presentation) e.g., (i) census methods including industry, population, etc.; (ii) methods for compiling birth, death, marriage, and other registration statistics; (iii) estimates of national income and capital formation; (iv) external trade, production, transport, and price statistics.

(c) Statistical methodology, including sampling.

National and International Measures For Full Employment

The United Nations Department of Economic Affairs has published "National and International Measures for Full Employment," a report by a group of experts appointed last year by the Secretary-General, at the invitation of the Economic and Social Council. The group consisted of John Maurice Clark and Arthur Smithies (United States), Nicholas Kalder (United Kingdom), Pierre Uri (France), and E. Ronald Walker (Australia).

The report discusses the nature of the full employment obligation and factors affecting attainment of the goal. The full employment target is defined in terms of a maximum allowable percentage of employment. Recommendations are made for domestic measures which should be taken (primarily measures to stabilize effective demand at a level consistent with the full employment objective), and for international measures (primarily policies for stabilizing international trade).

As part of the governmental machinery needed for implementation of the domestic measures, the following recommendation is made for statistics:

"Although the adoption of full-employment policies cannot await the perfecting of statistics, we draw the attention of all governments to the need to improve the collection and analysis of the statistical material necessary for the guidance of such policies. Certain of our recommendations require the preparation of monthly figures of total unemployment and also unemployment in certain sectors of the economy. If adequate figures of short-time work are not collected regularly, estimates should be made, by sample studies at appropriate intervals, to permit the calculation of the full-time equivalent of partial unemployment. Governments should also work towards the objective of publishing, at regular intervals, comprehensive figures showing employment and unemployment by major industrial groups, by areas, and by categories of workers (e.g., skilled, unskilled, white-collar employees, etc.). In addition, the effective planning and operation of most of the measures envisaged also require the regular collection and interpretation of a wide range of statistics relating to the level of economic activity in different branches of the national economy, and the preparation of estimates of the principal aggregates that together determine the level of effective demand (including national income, private and public investment, private and corporate saving, government revenue and expenditure, imports, exports and other items in the balance of payments)."

Reference is made in the report to "difficulties that may be encountered by some countries in equipping themselves with the necessary governmental machinery and statistical services." The United Nations and the specialized agencies are called upon to provide technical assistance in such cases on request.

Copies of the report may be obtained in the United States from International Documents Service, Columbia University Press, 2960 Broadway, New York 27, N. Y. The price is 75 cents, and the United Nations Publications Sales Number is 1949. II. A.3.

Recent Reports of the Joint Committee On the Economic Report

The Joint Committee on the Economic Report has now published final reports for each of the four subcommittees appointed last summer to study problems of low-income families, unemployment, investment, and monetary, credit and fiscal policies. The reports have been printed as follows:

Subcommittee on Low-Income Families

Low-Income Families and Economic Stability (April 1950)—S. Doc. No. 146 (20 cents)

Subcommittee on Unemployment

Employment and Unemployment (February 1950)—S. Doc. No. 140 (30 cents)

Subcommittee on Investment

Volume and Stability of Private Investment (March 1950)—S. Doc. No. 149 (15 cents)

Subcommittee on Monetary, Credit and Fiscal Policies

Monetary, Credit and Fiscal Policies (January 1950)—S. Doc. No. 129 (15 cents)

Additional publications of the Committee include:

A Handbook of Regional Statistics which was prepared for the Subcommittee on Unemployment. This 455-page handbook presents annual data for selected years by states and regions on land, population, employment, unemployment, manufacturing, construction, agriculture, timber resources, minerals, income payments to individuals, and a group of selected economic indicators such as bank deposits, production of electric energy, etc.—Committee print ($1.00)

Highways and the Nation's Economy—S. Doc. No. 145 (20 cents)

Hearings on the January 1950 Economic Report of the President (March 1950)

International Association for Research in Income and Wealth

The quarterly *International Bibliography on Income and Wealth* will henceforth be prepared and issued by the National Institute of Economic and Social Research in London.

The secretariat of the Association has been transferred from New York to the following address—Miss Phyllis Deane, c/o The Natioinal Institute of Economic and Social Research, 2 Dean Trench Street, Smith Square, Westminster, London S.W. 1, England.

National Income Statistics of Various Countries, 1938-1948 was completed and published in May 1950. The new issue includes detailed statistics of national income for 32 countries and social accounts for 12 countries. A separate chapter has been added on statistics of the breakdown of national income by industrial origin, by categories of final expenditure, and by distributive shares. The tables in the appendix have been extended to cover longer series from the middle of the 19th century to 1948. A special table has been added on real per capita income, 1938-1948 for 16 countries.

Dinner, $2.50

The Preparation of Sampling Survey Reports

STATISTICAL OFFICE OF THE UNITED NATIONS

1. General Description of the Survey

A general description of the survey should be given for those who are primarily interested in the results rather than in the technical statistical aspects of the sample design, execution, and analysis. These technical aspects should be described in fuller detail in separate sections or appendices; the ground to be covered has been indicated in the subsequent sections of this memorandum. The general description should include information on the following points:

a. *Statement of Purposes of the Survey:* A general indication should be given of the purposes of the survey and the ways in which it had been expected that the results would be utilized.

b. *Description of the Material Covered:* An exact description should be given of the geographical region and the categories of material covered by the survey. In a survey of a human population, for example, it is necessary to specify whether such categories as hotel residents, institutions (e.g. boarding houses, sanatoriums), vagrants, military personnel, were included. The reporter should guard against any possible misapprehension regarding the coverage of the survey.

c. *Nature of the Information Collected:* This should be reported in considerable detail, including a statement of items of information collected but not reported on. The inclusion of copies of the schedules and relevant parts of the instructions used in the survey (including special rules for coding and classifying) is often of value. If this is impracticable, it may be possible to make available a limited number of copies which may be obtained on request.

d. *Method of Collecting the Data:* Whether by interviewers, investigators, mail, etc.

e. *Sampling Method:* An indication should be given in general terms of the type of sampling adopted, the size of the sample, the proportion it forms of the material covered, and arrangements for follow-ups, if any, in cases of non-response.

f. *Repetition:* State whether the survey is an isolated one undertaken without intention of repetition, or is one of a series of similar surveys.

g. *Date and Duration:* The date or period of time to which the data refer should be stated, and also the starting date and period taken for the field work.

h. *Accuracy:* A general indication of the accuracy attained should be given.

i. *Cost:* An indication should be given of the cost of the survey, under such headings as preliminary work, field investigations, analysis, etc

j. *Assessment:* The extent to which the purposes of the survey were fulfilled should be assessed.

k. *Responsibility:* The name of the organization sponsoring the survey should be stated; also the name of the one responsible for conducting it.

l. *References:* References should be given to any published reports or papers relating to the survey.

2. Design of the Survey

The design of the survey should be carefully specified. The following terms are believed to cover the main types of design, and to conform in the main with current terminology in so far as this has been established:

a. *Frame:* The frame or "substrate" consists of previously available descriptions of the material in the form of maps, lists, directories, etc., from which sample-units may be constructed and a set of units selected. The specification of the frame should define the geographical scope of the survey and the categories of material covered; also the date and source of the frame. Frames that are initially available often require emendation, particularly in the later

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These recommendations have been prepared by the Sub-Commission on Statistical Sampling in the hope that they will be of assistance to those engaged in the preparation of reports of sampling surveys. They necessarily involve technical terminology, the use of which will foster clarity, comprehensiveness, and international comparability in reports that deal with aims, methods used, and accuracy attained. Information supplied on the lines suggested will enable those making use of the report to utilize the results obtained to full advantage, to assess for themselves the reliability of these results, and to utilize the experience gained in the conduct of the survey in planning future surveys on similar material. The recommendations are not intended to be final, but are to be regarded as an outline of the various points which require description and analysis in the application of sampling methods in censuses and surveys. Comments should be addressed to the Statistical Office, United Nations, Lake Success, N. Y., U. S. A.

stages of multistage sampling, before they may be considered adequate; at times a frame may need to be constructed *ab initio*. In such cases the method of emendation or construction should be described.

b. *Elementary Units:* Units which are the smallest parts of the material capable of possessing a particular characteristic. Elementary units may, therefore, be of different types (e.g. number of children is a characteristic of a family, age is a characteristic of an individual), for example, at different stages of multi-stage sampling.

c. *Sample-units:* The units which form the basis of the sampling process. The sample-units may be (i) the same as the elementary units or (ii) groups of such units capable of possessing all the characteristics required. A group may consist of a cluster of contiguous elementary units, or a number of units arranged in an assigned configuration. A systematic pattern of elementary units may, for instance, constitute a sample-unit.

It is conceptually convenient that the sample-units be so defined that the totality of sample-units contains every elementary unit once and once only.

If this condition is departed from (e.g. by the use of circular areas in area sampling) attention must be paid to the question of whether bias is likely to arise owing to boundary conditions or other factors.

It is important to specify the quantitative and qualitative characteristics of the sample-units which have been recorded in the enquiry, as these form the basis of all subsequent analysis, and in the cases of multi-stage and multi-phase sampling, may also have been used in determining the sampling procedure.

Sample-units may be of the same or different size. They may contain the same or approximately the same number of elementary units or they may contain widely differing numbers. The estimation of the population values and of the sampling errors is simplest when the sample-units within a stratum are of approximately the same size, or contain the same number of elementary units.

d. *The Sample:* The aggregate of the sample-units selected constitutes the sample. A sample supplies both objective estimates (of means, totals, etc.) and information for estimating their precision. The word sample may be used either for the aggregate of sample-units chosen from a single stratum, or in a wider sense, for the whole of the sample-units chosen in a complete enquiry. In the first sense the sample is usually a specified fraction of the stratum it represents.

e. *Domain of Study:* Any sub-division about which the enquiry is planned to supply numerical information of known precision may be termed a domain of study. It is desirable to indicate the smallest domains of study about which the enquiry may be expected to provide information of adequate accuracy.

f. *Block of Domains:* A group of two or more domains of study, contrasts between which it is required to evaluate, may be termed a block of domains.

g. *Field of Enquiry:* The entire field of an enquiry is coextensive with the frame used as its basis, and will often consist of a number of blocks of domains.

h. *Stratification:* The totality of elementary units included in the frame may be divided into groups or "strata," each stratum being sampled separately so that a specified number of sample-units is obtained from each stratum. Such strata may be geographic sub-divisions, divisions depending on some quantitative or qualitative variate appertaining to the sample-units, etc.

i. *Uniform and Variable Sampling Fractions:* The numbers of sample-units specified may be such that from each stratum the same fraction of units is selected, in which case the term stratification with uniform sampling fraction, or proportionate sampling, is used; or the numbers specified may be such that different fractions of the different strata are selected, in which case the term stratification with variable sampling fraction is used.

j. *Multiple Stratification:* In certain cases the totality of elementary units may be divided simultaneously according to two or more classifications, each of which depends on one geographic, quantitative, or qualitative variate. Each cell determined by the two or more way classification itself potentially constitutes a stratum of the totality of elementary units. If each of the cells is sampled separately, as in an ordinary stratified sample, the term multiple stratification may be used without qualification. If the available information is not adequate for this to be done, so that the numbers of sample-units in the main strata only can be pre-determined, this is termed multiple stratification without control of sub-strata or marginal stratification.

k. *Multi-Stage Sampling:* In multiple-stage sampling the material is regarded as made up of a number of first-stage units each of which is made up of second-stage units, and so on.

There is thus a hierarchy of different types of units, each first-stage unit being divided (or potentially divisible) into second-stage units, etc. At the first stage of sampling, a number of first-stage units are selected; from each of the selected first-stage units, a number of second-stage units are then selected and so on.

For example, a country may be considered as divided into a number of districts; each district into a number of villages: each village into a number of farms. In multi-stage sampling a number of districts is selected in the first-stage; within each such selected district a number of villages is selected in the second-stage, and from each selected village a number

of farms is selected at the third-stage for enquiry. In the case of a crop-cutting investigation, the work may be carried further by the selection of fields from each selected farm and by plots within a field.

In multi-stage sampling a frame will be required at each stage for the units that have been selected at that stage. Initially, a frame is required by which first-stage units may be defined and selected. For the second-stage of selection, a frame is required by which second-stage units may be defined within the first-stage units which have been selected. One of the advantages of multi-stage sampling is that second-stage frames are only required for selected first-stage units and so on.

The devices of stratification and a variable sampling fraction may be used at any stage. If a variable sampling fraction at the first stage is used, the sampling fractions at the later stages may be adjusted so as to give a uniform overall sampling fraction. If selection is with probability proportional to size at the first stage (see Section 3), the sampling fractions at the later stages may be similarly adjusted to give equal probability of selection to all elementary units.

l. *Multi-phase Sampling:* It is sometimes convenient and economical to collect certain items of information on the whole of the units of a sample, and other items of information on only some of these units, these latter units being so chosen as to constitute a sub-sample of the units of the original sample. This may be termed two-phase sampling. Information collected at the second or sub-sampling phase may be collected at a later time, and in this event, information obtained on all the units of the first-phase sample may be utilized, if this appears advantageous, in the selection of the second-phase sample. Further phases may be added as required.

It may be noted that in multi-phase sampling, the different phases of observation relate to sample-units of the same type, while in multi-stage sampling, the sample-units are of different types at different stages.

An important application of multi-phase sampling is the use of the information obtained at the first-phase as supplementary information to provide more accurate estimates (by the method of regression or ratios), of the means, totals, etc., of variates obtained only in the second-phase. This is sometimes called correlated variate sampling.

Information obtained in a complete census may be used in this manner to improve the estimates obtained from a sample, in which case the complete census and sample are analogous to the first- and second-phase sample respectively.

Multi-phase sampling may be combined with multi-stage sampling. In a scheme for the estimation of the acreages and yields of an agricultural crop, for example, a two stage sample of villages and farms may be taken for the estimation of acreages, and a sub-sample of these farms may be taken for the estimation of yields. This is two-phase at the second stage.

A more complicated example is the following: 100 villages are selected at random out of 5,000 villages (first-stage selection); and the number of trading establishments is counted in each selected village (first-stage observation). A selection is then made of a fraction of (or perhaps all) villages which have one or more trading establishments (first-stage second-phase selection); and in each such village, a selection is made at random of 10 farms (second-stage selection based on first-stage observation). An enquiry is made about crops grown in the selected farms (second-stage observation). A selection is then made of a fraction of (or perhaps all) farms which grow cotton (second-stage second-phase selection); and an enquiry is made among these farms whether the cotton is sold through the village trading establishments or otherwise (second-stage second-phase observation).

m. *Interpenetrating (Networks of) Samples:* Whatever be the method of choosing the sample-units (with or without stratification; single or multi-stage; single or multi-phase), it is possible if desired to arrange the sample-units in sets of two or more interpenetrating (networks of) samples within each domain of study, and to collect the information for each such sample in an independent manner so that each sample would supply an independent estimate of the variates under study. In such cases the interpenetrating samples may be regarded as analogues of plots in the theory of design of experiments, and an analysis of variance can be carried out in the usual way. Another term for this procedure is replicated sampling.

It is possible to keep some of the sample-units the same in two (or more) interpenetrating networks of samples so that information for such sample-units are independently collected twice (or more than two times). It is then possible to make detailed comparisons between the two (or more) sets of observations. Such sample-units which are observed more than once are called duplicated (triplicated, quadruplicated, etc.) sample-units.

Interpenetrating samples can be used to secure information on non-sampling errors such as differences arising from differential interviewer bias, different methods of eliciting information, etc.

The interpenetrating network therefore provides a means of control (i.e. appraisal) of the quality of the information. For example, in a family budget enquiry, in each domain of study the sample-units may be chosen in the form of two or more independent sets each of which covers the whole domain, and the information for every such set may be collected by a different investigator. In this way, an independent estimate for the whole domain would be obtained based on the material collected by each investigator, and a comparison of such independent estimates (by analysis of variance) would show whether there were significant differences between different investigators

which may often indicate appropriate action for improving the planning of similar surveys in the future.

n. *Composite Sampling Schemes:* There are occasions on which different methods of sampling are required for different parts of the material. In sampling a human population, for instance, some form of sampling of areas (in which the sample-unit is a small area) may be most suitable for the rural parts of the country whereas some form of sampling based on lists of households may be best in the towns. This may be termed a composite sampling scheme.

o. *Successive (or Repeated) Surveys:* Sometimes a sample survey of the same kind is repeated at suitable intervals to constitute a series of successive surveys. In such cases it is possible to choose entirely independent sample-units in each survey, or to keep a certain number (or a certain proportion) of sample-units the same in two or more surveys. This latter procedure is particularly useful for the study of changes. The continuing operation of a survey agency on successive surveys of the same type usually also leads to a gradual improvement in the quality of the information.

p. *Pilot and Exploratory Surveys:* In undertaking large scale surveys, particularly of unexplored material, it is usually advisable to conduct pilot and exploratory surveys to test and improve field procedure, and schedules, and to train field workers; at the same time to obtain information which will enable the sample-design to be planned more efficiently, and to obtain an estimate of the cost. For example, the results of a pilot survey may be used to estimate the first- and second-stage components of variance relevant to some two-stage sampling process which is envisaged for the main survey and also the relevant components of cost, from which it is possible to determine the optimum intensity of sampling at each of the two stages.

3. Method of Selecting Sample-Units

The reporter should describe the procedure used in selecting sample-units, and if it is not a random selection he should indicate the evidence on which he relies for adopting an alternative procedure. Purposive selection and quota sampling cannot be regarded as equivalent to random sampling.

A process is properly described as random if to each unit has been initially assigned a determinate probability of being selected. One expeditious way of effecting a random selection is by the use of random sampling numbers; equally, with more labour, this may be done by any of the apparatus used in games of chance. Systematic selection is often used when the person responsible for the planning of the survey is satisfied that it is in practice equivalent to a random selection in the respects required. In such cases he accepts personal responsibility for the judgment on which his plan is based.

Ordinarily all units within a given stratum are assigned an equal probability of selection, sampling being "without replacement," i.e. no unit is included more than once in a sample. In certain cases it may be advantageous, or convenient, to select the sample-units with probabilities proportional to some known quantitive characteristic of the units, such as size; if more than one unit is to be selected from the population (or from individual strata) exact probabilities proportional to size can only be simply attained if the sampling is "with replacement," units selected twice or more being counted twice or more.

The methods of calculating the population estimates appropriate to samples selected with probability proportional to size differ from those for samples selected with uniform probability.

4. Personnel and Equipment

It is desirable to give an account of the organization of the personnel employed in collecting, processing and tabulating the primary data, together with information regarding their previous training and experience. Arrangements for training, inspection and supervision of the staff should be explained; as also should methods of checking the accuracy of the primary data at the point of collection. A brief mention may be made of the equipment used.

5. Statistical Analysis and Computational Procedure

The statistical methods in the compilation of the final summary tables from the primary data should be described. If any more elaborate processes of estimation than simple totals and means have been used, the methods followed should be explained, the relevant formulae being reproduced where necessary.

The steps taken to ensure the elimination of gross errors from the primary data (by scrutiny, sample checks, etc.) and to ensure the accuracy of the subsequent calculations should be indicated in detail. Mention should be made of the methods of processing the data (punched cards, hand tabulation, etc.) including methods used for the control of errors.

If a critical statistical analysis of the results embodied in the final summary tables has been made, it is important that the methods followed should be fully described. A numerical example is often of assistance in making the procedure clear.

It frequently happens that the quantities of which estimates are required do not correspond exactly to those observed; in a crop-cutting survey, for example, the yields of the sample plots give estimates of the amount of grain, etc., in the standing crop, whereas the final yields will be affected by losses at harvest. In such cases adjustments may have to be made, the amount of which is estimated by subsidiary observa-

tions, or otherwise. Account should be given of the nature of these adjustments and the ways in which they were derived.

The amount of tabular matter included in the report, and the extent to which the results are discussed, will depend on the purposes of the report. Mention should be made of further tabulations which have been prepared but are not included in the report, and also of critical statistical analyses which failed to yield results of interest and which are therefore not considered to be worth reporting in detail.

The inclusion of ancillary information which is not of immediate relevance to the report but which will enable subsequent workers to carry out critical statistical analyses which appear to them to be of interest should be carefully considered. If, for example, in addition to the class means of each main classification of the data, the sub-class numbers (but not the means) of the various two-way classifications are reported, a study of the effects of each of the main classifications freed from the effects of all other classifications can be made (provided the effects are additive) without further reference to the original material.

6. Costing Analysis

An important reason for the use of sampling (instead of complete enumeration) is lower cost. Information on costs is therefore of great interest. Costs should be classified so far as possible under such heads as preparation (showing separately the cost of pilot studies), field work, supervision, processing, analysis, and overhead costs. In addition, labour costs in man-weeks of different grades of staff, and also time required for interview and journey time and transport costs between interviews, should be given. The compilation of such information, although often inconvenient, is usually worth undertaking as it may suggest substantive economies in the planning of future surveys. Efficient design demands a knowledge of the various components of cost, as well as of the components of variance.

7. Accuracy of the Survey

a. *Precision as Indicated by the Random Sampling Errors Deducible from the Survey:* Standard deviations of sample-units should be given in addition to such standard errors (of means, totals, etc.) as are of interest. The processes of deducing these estimates of error should be made entirely clear. This process will depend intimately on the design of the sample survey. An analysis of the variances of the sampling units into such components as appears to be of interest for the planning of future surveys, is also of great value.

The term "sampling error" has been used to denote both sampling standard error and limits of sampling error at some assigned level of probability, e.g. twice the standard error corresponding approximately to the 1 in 20 level of probability. The sampling standard errors and the limits of sampling error should be clearly differentiated and the multiples used in the latter should be specified.

b. *Degree of Agreement Observed Between Independent Investigators Covering the Same Material:* Such comparison will be possible only when interpenetrating samples have been used, or checks have been imposed on part of the survey. It is only by these means that the survey can provide an objective test of possible personal equations (differential bias among the investigators).

c. *Other Non-Sampling Errors:* Errors which are common to all investigators, and indeed any constant component of error (or "bias") in the recorded information, will not be included in the estimates of the random sampling errors deducible from the survey results. Another source of error is that due to incorrect determinations of the adjustments (referred to in Section 5) arising from observation of quantities which do not correspond exactly to the quantities of which estimates are required.

The existence and possible effects of such errors on the accuracy of the results, and of incompleteness in the recorded information (e.g., non-response, lack of records, whether covering the whole of the survey or particular areas or categories of the material) should therefore be fully discussed. Any special checks instituted to control and determine the magnitude of these errors should be described, and the results reported.

d. *Accuracy, Completeness and Adequacy of the Frame:* The accuracy of the frame can and should be checked and corrected automatically in the course of the enquiry, and such checks afford useful guidance for the future. Its completeness and adequacy cannot be judged by internal evidence alone. Thus, complete omission of a geographic region or the complete or partial omission of any particular class of the material intended to be covered cannot be discovered by the enquiry itself and auxiliary investigations have often to be made. These should be put on record, indicating the extent of inaccuracy which may be ascribable to such defects.

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This document was originally prepared by the Sub-Commission on Statistical Sampling of the Statistical Commission at its second session, 30 August to 11 September 1948. In its report to the Statistical Commission the Sub-Commission stated:

"The Sub-Commission considered that if accounts of sampling investigations included the points enumerated, and if they dealt with the technical aspects of sampling processes in accordance with the recommended terminology, it would become increasingly possible to improve sampling practices in many important respects. The Sub-Commission believed that the wide circulation of reports, prepared generally in accordance with the suggestions contained in the memorandum, will foster international exchange of experience, and will suggest the use of sampling in various undertakings now being carried out by complete counts or by non-random partial surveys." (Document E-CN.3-52).

The members of the Sub-Commission are: Professor G. Darmois, Dr. W. E. Deming, Professor P. C. Mahalanobis (Chairman), Dr. F. Yates, and Professor R. A. Fisher (Consultant).

Eight Hundred People Interested in Mechanical Brains

by E. C. BERKELEY

In the last three years an organization eight hundred strong has come into existence. It is devoted to informal communication among the men and women who are seriously interested in the new machinery for handling information automatically. These machines are often called automatic computers, or large-scale calculating machines, but often nowadays they are called *mechanical brains.* The name of this new organization is the Association for Computing Machinery; and its purposes are to advance the science, design, construction, and applications of the new machinery for computing, reasoning, and performing other operations of mathematics, logic, and kindred fields. Membership is open to any one who is seriously interested in the field; dues are $2 a calendar year.

Birth of the Association

How did this organization begin? In January 1947, the Harvard Computation Laboratory held its first symposium on "Large Scale Calculating Machinery," a three-day conference where more than 300 people were present. On the third day, Professor Samuel H. Caldwell of Massachusetts Institute of Technology, in the course of a talk, suggested an association of those who were interested in the new field of automatic computing machinery. The discussion of Professor Caldwell's talk at the conference endorsed his proposal, and in an informal way referred action on it to the National Research Council committee on large-scale calculating machinery.

On April 28, the committee held its next subsequent meeting in New York. The proposal was put before the committee that it should take the initiative in forming an association to bring together those who were interested in automatic computing machinery. The committee was not convinced that there was as yet sufficient interest, or that it was desirable to form still another society. They decided that they would take no action until their next committee meeting, a year later.

Such a decision did not satisfy some of the younger men in the field, who felt very much the need for getting together informally with men in other organizations and exchanging ideas and information. A "Temporary Committee for an Eastern Association for Computing Machinery" was promptly formed in May. It consisted of two or three men from each of four centers of computer interest, Boston, New York, Philadelphia, and Washington. The group included E. G. Andrews, E. C. Berkeley, R. V. D. Campbell, John W. Mauchly, James L. McPherson, John B. Russell, T. Kite Sharpless, Richard Taylor, and C. B. Tompkins. The temporary committee sent out an inquiry early in the summer, received over a hundred expressions of interest, and called a meeting in September at Columbia University. Over seventy-five persons attended that meeting. The first part of the meeting was devoted to a discussion of the pilot model of the Edvac, and the second part of the meeting organized the "Eastern Association for Computing Machinery," with a Council with some temporary officers, and a mandate to the Council to proceed.

Growth of the Association

In the next few months the Council met several times and discussed its mission. It gradually established policy: to keep the organization informal, to encourage meetings and discussions, to put out mimeographed information but no printed or more formal publications, and to maintain a mailing list of persons interested in the field (at first both members and nonmembers, later only members).

The Council discussed the possibility of becoming a section of some other society that was interested in the field, such as electrical engineering, or radio, or physics or mathematics; but always came back to the conclusion that that would be inefficient: it did not want to saddle computing machinery men with the heavy dues of a regular professional society or send them a large proportion of information that they would not be interested in.

From a modest beginning of about a hundred members in the fall of 1947, the Association grew rapidly. Soon there was such wide representation of membership that the Council dropped the term "Eastern," and the association became the "Association for Computing Machinery." Four of the seven members of the National Research Council committee have become members of the Association. The Association has in all over eight hundred members who are located all over the United States, and in many other parts of the world including Australia, Belgium, Canada, England, France, the Netherlands, and Sweden. At the present time, discussions are going on for organizing sections in California and Sweden, in addition to the four existing sections in Boston, New York, Philadelphia, and Washington.

Fields of Interest

Many fields of interest are represented among the members of the association. For example, in the sciences, there are physicists, atomic scientists, chemists, crystallographers, biologists, psychologists, economists, mathematicians, statisticians, and many others. As to engineering, there are electrical engineers, mechanical engineers, radio engineers, methods engineers, and other kinds. In business, there are men from insurance companies, mail order houses, office machine manufacturers, railroads, public utilities, market research organizations, department stores, and many other businesses. In government, there are men from ordnance laboratories, proving grounds, the Social Security Administration, the Bureau of the Census, the National Bureau of Standards, research offices, the Bureau of the Budget, and many other government organizations. It is striking to read the list of members of the association, and notice the wide appeal of automatic machinery for handling information—seeing the large number of people who have already realized that a mechanical brain is likely to be useful to them in the problems which they have on hand to solve.

The Usefulness of Automatic Computing Machinery to Statisticians

Automatic computing machinery is of considerable significance to statisticians.

For example, in order to determine the properties of complicated physical situations (structures or processes), a method called the Monte Carlo method has been developed. Briefly, a table of random numbers is used to construct one by one a statistical collection of a thousand or ten thousand instances of the physical situation; the properties of the statistical collection are then computed; and these properties are then assumed to apply generally, within a margin of error. An automatic computer is often useful in producing the collection of instances, and there are processes whereby the machine itself can compute random numbers just as well as almost any other process can produce them.

Another example of the importance of computing machinery to statisticians is multiple factor analysis and similar analysis of large collections of statistical information. For example, suppose we give 20 tests to 100 persons, each test with 50 items in it. We shall obtain 100,000 statistics. What have we measured? Which of these tests are important, which can be dispensed with? Answering such questions as these often requires computing capacity of high order.

For a third example, consider the statistical work of the Bureau of the Census. The Bureau was the place where automatic computing machinery for handling information was first invented. Here in the 1880's punch card calculating machinery was devised by Dr. Herman Hollerith. The data from the current 1950 Census is expected to be analyzed in part on a large-scale electronic calculating machine that has been on order for two years. The machine is Univac, being constructed by the Eckert-Mauchly Computer Corp., a subsidiary of Remington-Rand, Inc. It is expected to have a speed of 1,000 arithmetical operations a second. If it is available soon enough, it will greatly shorten and sweeten the calculations of the 1950 Census.

The statistical field is one of the important fields for the application of automatic calculating machinery; and the Association for Computing Machinery is a good way for keeping abreast of developments, a highway of easy communication through many scientific worlds, and across many intellectual boundaries.

The Preparation of Sampling Survey Reports

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e. *Comparison with other Sources of Information:* Every reasonable effort should be made to provide outside comparisons with other sources of information. Such comparisons should be reported along with the other results, and the significant differences should be discussed. The object of this is not to throw light on the sampling error, since a well designed survey provides adequate internal estimates of such errors, but rather to gain knowledge of biases, and other non-random errors.

f. *Efficiency:* The results of a survey often provide information which enables investigations to be made on the efficiency of the sampling designs, in relation to other sampling designs which might have been used in the survey. The results of any such investigations should be reported. To be fully relevant the relative costs of the different sampling methods must be taken into account when assessing the relative efficiency of different designs and intensities of sampling.

Such an investigation can be extended to consideration of the relation between the cost of carrying out surveys of different levels of accuracy and the losses resulting from errors in the estimates provided. This provides a basis for determining whether the survey was fully adequate for its purpose, or whether future surveys should be planned to give results of higher or lower accuracy.

g. The critical observations of the technicians in regard to any part of the survey should be given. These observations will help others to improve their operations.

The National Bureau of Economic Research

by GEOFFREY H. MOORE

What manner of organization is the National Bureau of Economic Research? How does it select research topics? Who does the work and what kind of tasks do they perform? Where do the funds come from? How does the National Bureau safeguard the scientific quality of its findings? How are the results disseminated? Visitors to the National Bureau often ask these and similar questions; perhaps the answers will be of interest to readers of the *American Statistician.*

The National Bureau of Economic Research is a private non-profit corporation, formed, according to its charter, "to conduct, or assist in the making of exact and impartial investigations in the field of economic, social and industrial science, and to this end to cooperate with governments, universities, learned societies, and individuals." Hence it is not a government agency, nor an adjunct of a university, nor does it sell research services. The revenue from the only products it does sell, publications, barely covers the printing costs. Its funds are contributed by philanthropic foundations, by trade and professional organizations, by business concerns, trade unions, and individuals. Contributions are usually on a yearly basis, but some grants cover several years. Some of the funds are earmarked for specific studies; the balance goes to support a general program of research.

The National Bureau is governed by a Board of Directors numbering about thirty, selected to represent various institutions and diverse points of view on economic problems. Over the years since the Bureau was founded in 1920 this body of men has made a significant contribution to the development of scientific inquiry in economics, both within the National Bureau and outside. Such outstanding economists as Wesley C. Mitchell, George E. Roberts, Allyn A. Young, Edwin F. Gay, Thomas S. Adams, and John R. Commons have been among its members. At the present time professors from a dozen universities are on the Board. Also, Directors from each of the following organizations are elected: American Statistical Association, American Economic Association, American Farm Economic Association, Economic History Association, American Institute of Accountants, American Management Association, Congress of Industrial Organizations, and American Federation of Labor. Finally, there is a group of Directors at Large, men from varied walks of life with an abiding interest in economic research.

The Board serves an important function not only in shaping the broad lines of the research program but also in safeguarding the quality of the results. Matters of policy requiring prompt action are handled by an Executive Committee of eleven, elected by the Board from its membership. Arthur F. Burns, the Director of Research, is the member of the Committee who is directly responsible for the research program. The members of the research staff, numbering about twenty-five, direct the individual studies, and are aided in their work by upwards of forty-five research assistants. A staff of typists, bookkeepers, mimeograph operators, etc., brings the total payroll of the National Bureau to roughly a hundred persons. William J. Carson, the Executive Director, handles the Bureau's finances, accounts, and other administrative matters.

Not all the employees of the National Bureau work at the main office at 1819 Broadway, New York City. Dur Financial Research Program is housed at "Hillside," an estate about 10 miles north of Manhattan overlooking the Hudson River. Other National Bureau investigators are to be found at various universities throughout the United States, since cooperative arrangements are maintained with a number of universities that permit their faculty members to engage in National Bureau studies. Government agencies, too, cooperate in similar ways.

Such cooperative relationships are a vital feature of our work, and we try to foster them in many ways. The growing acceptance on the part of universities of the view that research is part of the job of a faculty member has helped to make these efforts productive. For example, for a number of years we have appointed promising young men or women holding university positions as Research Associates for one year. The objective is to enable scholars to pursue their research interests in fields in which the National Bureau also has an interest. Since 1930 twenty-six Research Associates, coming from eighteen American colleges or universities and two foreign universities, have been appointed under the plan.

The work of several committees is another example of cooperation for the purpose of advancing research. Two committees, one on financial and the other on fiscal research, help to guide our studies in these areas. They are composed of experts from universities, government agencies, and private business. In 1935 the Universities-National Bureau Committee was established for the express purpose of promoting contact

between the work of the universities and that of the National Bureau. The committee then included representatives of twelve universities. Recently it decided the time had come to enlarge its membership, and twenty-eight universities have now accepted the responsibilities of membership on the new Committee.

The Conference on Research in Income and Wealth, out of which has grown a notable series of *Studies in Income and Wealth,* is one of the long-standing activities originated by the Universities-National Bureau Committee. In 1947 the Committee projected a series of special conferences. One on research in the economic growth of nations was held in 1948 and another on research in business cycles in 1949. Research in business finance will be the topic of a conference this June, and a conference on investment and economic stability is being planned for next year. Such conferences bring together specialists in the field and improve their understanding of each other's work. Since the papers presented are circulated in advance, participants can come with full knowledge of what is to be discussed and the meeting can be devoted largely to discussion. The conferences draw very extensively on work outside of the National Bureau, though members of the Bureau staff also present papers and join in the discussion.

To return to the work within the Bureau, let us take a look at the varied tasks of the research assistants. The typical assistant is young, has a college degree, and has majored in economics and statistics. Some have been with us a number of years, but most are relatively new to economic research. Many have done or are doing graduate work, and we try to arrange the individual's hours of work to permit this. Recently we began a program of seminars for the assistants, at which staff members report on the progress of their research or talk on topics of general economic interest.

The members of the staff supervise the work of the assistants assigned to them; the assistants themselves bear varying degrees of responsibility, depending on their experience and equipment. They compile data, write descriptions of series, delve in the library, prepare memoranda, analyze time series, draw charts, and check one another's work. As this list suggests, their work has a strong statistical slant. The kinds of skills required for or acquired on a particular job vary. Some assistants have a broad knowledge of statistical sources and are expert in using them. Much of this material requires rectification to assure comparability or appropriate coverage; assistants develop the information necessary to make these adjustments. Other assistants are familiar with the varied problems met with in analyzing time series. Sampling procedures have been used extensively by the Financial Research Program; assistants edit and tabulate the returns. An IBM installation at "Hillside" is being used to tabulate a census of corporate bonds, and recently various sorts of time series analyses have been run on this equipment; assistants put the materials in shape for these operations. Some assistants are especially familiar with a particular subject, such as national income, commodity prices, or the labor market, and compile the materials necessary, for example, to draw a Lorenz curve of the income distribution, to compute an index of consumers' goods prices, or to estimate the membership of trade unions.

How do new research projects originate at the National Bureau? There is no single pattern, but a major consideration is whether a proposed investigation is likely to make previous studies more fruitful, or contribute significantly to work in progress, besides making its direct contribution. This policy has been pursued by the National Bureau from its founding. As a result, research on problems that have only a current day-to-day interest is held to a minimum. Research of a fundamental sort, such as estimating national income, finding out what happens during business cycles, measuring secular trends in production and employment, has been our prime concern. Problems suggested by one investigation are deliberately developed in subsequent investigations, the results of the first aid those that follow, and those that follow help to check the conclusions of the first. The 1947 Annual Report of the National Bureau stressed the importance of this feature of the Bureau's program, illustrating it by a review of our investigations of capital formation.

Of course, this does not mean that investigations of topics of the day are not important. There is an urgent need for topical research as well as the fundamental research on which we have concentrated. In fact the National Bureau has sometimes undertaken investigations that only indirectly reinforce its long-term program. For example, in the spring of 1948 Herbert Hoover, Chairman of the Commission on the Organization of the Executive Branch of the Government, requested us to appraise the organization and efficiency of Federal statistical agencies, and to report within six months. We undertook the hurried task, and submitted a report on schedule. A summary was published by the Commission; the full report, by Frederick C. Mills and Clarence D. Long, was published by the National Bureau last year. Not least among the considerations prompting our decision to do the job was the fact that the character of the work done by government statistical agencies is vital to the progress of economic research.

Another factor bearing on our choice of research projects should be mentioned. The National Bureau does not make recommendations concerning economic policy. What should be done about it? is not the concluding question to which our reports address themselves. To develop the facts that bear on a problem, and to analyze them on a scientific basis—these are our objectives. Again, this is not to say that policy

questions are not important. On the contrary, they are so decisively important that their discussion should be lifted from the level of opinion to the level of fact, whenever possible. We recognize, of course, that many questions must be decided promptly and cannot await scientific determinations.

So much for general considerations bearing on the choice of problems to be investigated. To be more specific, let me describe briefly one investigation that was begun last year. A large study of the capital requirements of the American economy was started, with the aid of a generous grant by the Life Insurance Association of America. Its scope may be indicated by the three leading questions it will attempt to answer: 1) What has been the course of capital requirements in recent decades and what factors have determined it? 2) From what sources have our capital requirements been financed, and what factors have determined the use of—and choice among—sources of funds? 3) What is the current and probable future course of capital requirements and their financing? Obviously, these questions concern the fundamental workings of our economy and are of broad social significance, so they fit the criterion mentioned above. Secondly, the questions can be formulated definitely, and there is at least a good chance that appropriate techniques and data can be developed to answer them. Third, the study falls within an area of research in which the National Bureau has long had an interest—capital formation and its financing. Hence it will both draw upon and contribute to studies completed or under way. With funds available and a member of our staff, Simon Kuznets, eager to take charge of the work, it readily came within the orbit of our program.

A similar justification could be spelled out for other National Bureau investigations. Readers interested in the full program, or in particular phases of it, may get details from our Annual Reports. The current report, available on request, describes projects on national income and capital formation, employment and productivity, the labor market, business cycles, banking and finance, fiscal affairs, and international economic relations.

In all the studies that we undertake the obligation to maintain high scientific standards of competence and objectivity is a serious one. In the first instance, this is the responsibility of the individual in charge of the investigation. But certain procedures used by the National Bureau also contribute heavily to that end. Informal discussions among members of the staff are encouraged and are an important phase of the life of every Bureau investigator. Somewhat more formal staff meetings, at which an investigator must explain his procedures and findings to his colleagues, have a salutary influence, particularly because criticism is most effective when an investigation is in its early stages. Another device is staff reading of manuscripts. When an author has produced a manuscript it is circulated to the staff, and three or four members read it critically. They submit detailed comments to the author and to the Director of Research. Often at this stage we ask outside expects also to read the manuscript. The result is that each report, in a very real sense, is the product of many minds rather than of one.

When the Director of Research is satisfied with the condition of a manuscript, it is submitted to the Board of Directors for approval before publication. This is a significant step. Since the Board is composed of enlightened men with diverse views, the report must be of high scientific quality if it is to pass their review. Every member of the Board receives a copy, and three serve as a reading committee for each manuscript. If the three unanimously approve the document it is sent to press; if not, the author is given an opportunity to revise it. If agreement on a satisfactory revision cannot be reached, the question of publication may be placed before the entire Board. Directors have the privilege of inserting notes in the publication on points that they desire to criticize, amplify, or clarify.

All National Bureau monographs, Occasional Papers, and Technical Papers are treated in this manner. The process is time-consuming; the number of man-hours spent per page by authors and readers is sometimes prodigious. But the results, we think, justify the effort. If true progress is to be made in developing a science of economics some safeguards such as these are, indeed, necessary.

The ultimate measure of progress in a practical science is the use made of its results. How are the results of research at the National Bureau disseminated and used? Initially, they reach the ouside world by way of our publicaions. The publications go to contributors, and to other purchasers. There are several classes of contributor: those who subscribe to Occasional Papers only, receiving four for $2; associate contributors who pay $5 a year and receive all Occasional and Technical Papers issued during the year and a discount on purchases; and contributors of $25 or more a year, who receive all publications issued during the year and make other purchases at a discount.

Some recent publications of particular interest to readers of the *American Statistician* are:

Frederick C. Mills and Clarence D. Long, *The Statistical Agencies of the Federal Government.*

Studies in Income and Wealth, Volume Eleven (papers on the labor force, cost of living comparisons, economic forecasting, and the savings-income ratio).

Solomon Fabricant, "The Rising Trend of Government Employment," *Occasional Paper 29.*

Geoffrey H. Moore, "Statistical Indicators of Cyclical Revivals and Recessions," *Occasional Paper 31.*

CONTINUED ON PAGE 19

A Note on High School Courses in Quantitative Thinking

by A. C. ROSANDER

During the past few years mathematicians and statisticians have shown an increased interest in a high school course in elementary statistics. The purpose of this note is to call attention to some problems and some work which seem to have been overlooked.

While there is not likely to be much opposition to the need for such a course for purposes of general education, there will be differences of opinion with regard to the particular nature and content of such a course. More important, due to the crowded condition of the high school curriculum, considerable difficulty may be encountered to the introduction of such a course even as an elective. Furthermore, the heterogeneity of the high school population requires that more care be taken with regard to the content and motivation of such a course than is usually given to college courses in mathematics and statistics.

A wide variety of content has been proposed for such a course: social arithmetic, descriptive statistics, social-economic mathematics, quantitative thinking, elementary probability statistics. This diversity of emphasis and content is a healthy sign and should be encouraged; at this stage any attempt to standardize the content should be avoided.

At least four different ways have been proposed or used to develop and introduce such a course into the high school curriculum. One way is to put one or more chapters on statistics in elementary algebra, as was done by Mitchell and Walker.[1] While the statistics chapter in this book is largely graphs and averages, with no discussion of elementary probability, this approach has much to recommend it. It appears to be a feasible method and one which can be used with the minimum of opposition.

The second approach is that of using a college textbook in descriptive statistics as the basis of the course, as was suggested by Dutka and Kafka.[2] This practice of pushing a course down from college to high school is a familiar formula which has caused the high schools no end of trouble. While it may work in some high schools it is not likely to be very effective in high schools the country over. A statistics course which college students take largely because they have to, is not likely to succeed at the high school level as an elective. If in some schools the students have the required mathematical background, why not introduce elementary probability statistics directly? Why repeat the mistakes made at the college level by using descriptive statistics as the basic course?

The third approach is that of creating a new course based upon the social and economic roles of the individual, and weave into such content the quantitative material desired. This approach was used by Beatty and Boyce in 1936 at Bronxville, New York, in an actual experimental course offered to senior high school students.[3] A large body of materials was organized and mimeographed for the use of the students.[4] A great deal of work was done on these materials to make them accurate, socially useful, and pedagogically presentable. A regular mathematics instructor, sympathetic to this approach, was in charge of the course. (The reference to School Review contains the names and publisher of other materials prepared by Beatty and Boyce.)

What the Bronxville experiment seemed to indicate was that quantitative concepts can be taught at the high school level. Some of the students had no difficulty with such concepts as arithmetic mean, correlation, and sampling. This is important in view of the fact that the class represented the usual range of intelligence; it was not a picked class. It was concluded that "if these concepts (such as sampling) are properly simplified and taught in connection with a socially-useful content, they can be grasped without difficulty at the high school level."[3] Most of the shortcomings observed arose from material that was too difficult, or not well presented, or not well illustrated.

The writer's experience bears out this finding. First-course students in college can understand certain aspects of sampling and estimation just as easily as they can grasp the more orthodox material and calculations on averages, standard deviation, index numbers, and the correlation coefficient.

Some subject-matter specialists will not like this approach. It seems to smack of sugar coating. The student does not get enough mathematics and statistics. This is hardly the point. The goal is not to maximize the quantity of mathematics absorbed by the students. The goal is to explain principles and to show the student how to apply them to everyday problems, with the emphasis on the latter. The goal is general education, not vocational training.

A fourth approach is one suggested by the writer in two papers published in 1936.[5] This approach is a combination of social arithmetic, quantitaitve logic, and probability statistics. Examples from life (observations, newspapers, periodicals, and books) were cited as actual subject matter which might be used.

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[1] U. G. Mitchell and Helen Walker. Algebra: A Way of Thinking. Harcourt Brace and Co., New York, 1936. Chap. XI.

[2] S. Dutka and F. Kafka. "Statistical Training Below the College Level," American Statistician, February 1950.

[3] A. C. Rosander "An experimental course in quantitative thinking," School Review, May 1937.

[4] George Boyce and A. C. Rosander. Social Economic Mathematics. Two mimeographed volumes of materials, 1936.

[5] A. C. Rosander. "Quantitative Thinking on the Secondary School Level," Mathematics Teacher, February 1936; also "Mathematical Analysis in the Social Sciences," Mathematics Teacher, October 1936.

Examples were drawn from such topics as averages, percentages, rates, frequency distributions, sampling, probability, trends, and prediction. These materials could be made the basis of a separate course, or they could be incorporated into a chapter or chapters in an elementary algebra text. The writer favors an emphasis on the simple aspects of sampling, estimation, and inference with experimental demonstrations, rather than an emphasis on graphs, tables, and calculations from formulas. The values of experimental demonstrations of the basic principles of sampling and probability have been overlooked. These experiments are just as easy for the student to grasp as high school experiments in biology, chemistry, and physics; and they develop interest and provide a motivation which is hard to beat.

Statistics and Quality Control in Engineering Courses

The Subcommittee on College Courses of the American Society for Quality Control has conducted a survey on the teaching of courses in statistics and quality control among the engineering colleges of the United States and Canada. The study was conducted by means of a mail questionnaire sent to the 162 institutions listed in the year book of the American Society for Engineering Education. Of these institutions 105 actually replied, and the subcommittee was able to conclude that most of the non-repliers offer no substantial work in these fields.

Forty-nine institutions reported undergraduate courses in statistics; 35 reported reported undergraduate courses in quality control; and 21 reported graduate work in statistics and quality control. These courses were taught in many different departments of the universities, as shown by the following table:

WHERE COURSES ARE TAUGHT

Department Teaching	Undergraduate Stat.	Undergraduate Q.C.	Graduate Stat. & Q.C.
Mathematical and Statistical	26	10	8
Commerce	14	4	4
Engineering	8	20	7
Other	1	2	2
	49	35	21

In most engineering curricula, statistics and quality control are optional courses. The number of engineering students taking undergraduate statistics and quality control is roughly 6 percent of the estimated engineering enrollment in the 162 colleges studied. Even though this percentage is small, the absolute number of engineering students taking undergraduate statistics and quality control has increased very sharply between 1946 and 1949.

Statistics and quality control play a slightly larger part in graduate engineering programs than in the undergraduate. More than 10 percent of graduate students took such courses in 1948-49, compared with an estimated 6 percent in undergraduate curricula.

The conclusions of the committee are quoted below:

"Recognition of statistics as basic tool for all engineers is making real headway, and progress is being made in introducing basic and applied courses in the engineering colleges. Much work needs to be done to develop courses in statistics for engineers that are at once mathematically sound and of interest to the student.

"Industry is exerting pressure for undergraduate statistics on the engineering colleges. This pressure is honorably exerted by the attitude of recruiting personnel. This can and should be intensified by members of ASQC and their associates.

"The committee notes with some gratification that over half the courses available in quality control are presented by engineering departments, indicating an awakening interest in the statistical problem by the faculties.

"However, the engineering teachers are apparently not yet aware of the basic nature of statistics in the presentation and analysis of experimental data. It will be noted that in many cases both engineering and mathematics have defaulted to commerce schools in the presentation of general statistical methods. While this does not imply criticism of the latter for taking up the burden where others have failed, there is reason to doubt that instructors in commerce are able to present the complete position of statistical methods in the scientific method as applied to engineering. It can be emphasized that the aim should be for better engineers, not third-rate statisticians.

"Closer cooperation of local sections with instructors in engineering is desirable. In some cases, financial sponsorship of young instructors would be worthy of consideration. It must be remembered that these men already belong to several technical societies at their own expense.

"Readers who would appreciate a discussion of the problems involved in teaching of quality control are referred to an article by Edwin G. Olds and Lloyd A. Knowler in the June 1949 issue of the *Journal of the American Statistical Association* (Vol. 44, No. 246) 'Teaching Statistical Quality Control to Town and Gown'."

PAPERS ON THE THEORY OF PROBABILITY AND STATISTICS

from the Proceedings of the Russian Academy of Science, edited by EUGEN ALTSCHUL and WARREN C. WAITE will be published and distributed at cost, if a sufficient number of subscribers are secured. These interrelated papers by LEXIS, BORTKIEWICZ, and MAAKOV continue the work originated by Poisson and are available in English for the first time. Prices will range from 50 cents for brief papers to approximately $2.50 for long ones.

Titles of the 17 selected papers and further information about the contents may be obtained from—

THE AMERICAN STATISTICAL ASSOCIATION

1108 16th Street, N. W., Washington 6, D. C.

NEWS CONTINUED FROM PAGE 5

New 22-Scale Log Log Slide Rule Made in 5-Inch and 10-Inch Sizes

A new 5-inch log log All-Metal slide rule, bearing the identical scales of its larger 10-inch counterpart, is announced by Pickett & Eckel, Inc.

This Pocket Model 600 log log rule is 1/3/32" x 6" x 3/32" in size, weighs 2 ounces. Comes in a Pocket Case slip-boxed with Instruction Manual for $7.85. Manufactured by Pickett & Eckel, Inc., 5 South Wabash Avenue, Chicago 3, Ill.

Israel Institute of Applied Social Research Founded

The Israel Institute of Applied Research, which has just been established, is engaged in nation-wide opinion polls, the study of adjustment problems among new immigrants, the study of problems, plans and attitudes of Israel's youth. Projects are accepted from the various government departments and from other civic bodies, as well as market research for private firms and organizations. Basic social research and experiments in survey techniques will be important features of the Institute's theoretical work. It also cooperates in joint projects with scientific organizations in other countries.

A quarterly bulletin "What Israel Thinks" will be issued by the Institute—the first issue dated Spring, 1950. Annual subscription to the quarterly is $2.00.

Dr. Louis Guttman has recently resigned from his post at Cornell University in order to continue as scientific director of the enlarged Institute, while Dr. Uriel G. Foa continues as Executive Director. Communications should be sent to the new address: The Israel Institute of Applied Social Research, Sergei Building, Melisande Way, Jerusalem, Israel.

New Guide for Statistical Graphic Presentation

The University of Puerto Rico, School of Public Administration, is distributing a monograph on statistical graphic presentation prepared by Mary B. Novick and Victor R. Hernandez Mendez. This monograph is intended primarily as a guide for statistical draftsmen in the government agencies of Puerto Rico. It could also be used by teachers of statistics and by government statisticians as training materials. The manual includes instructions on planning charts, maps, etc., and a list of minimum equipment for draftsmen. There are 23 illustrations to guide the beginners. It is planned to complement this manual with another on tabular presentation and one on the writing of reports. Copies may be obtained from the School of Public Administration, Faculty of Social Science, University of Puerto Rico, Rio Piedras, Puerto Rico.

A.S.A. Members Elected Officers by Society of Military Accountants and Statisticians

At the annual meeting of the National Council of the Society of Military Accountants and Statisticians, Captain Joseph C. Armour was elected National President, and Major Samuel V. Anthone was elected First Vice President.

An Index of Nomograms

John Wiley and the Technology Press of the Massachusetts Institute of Technology have joined forces in publishing an index of nomograms compiled and edited by Douglas P. Adams. The book gives the location and content of seventeen hundred alignment diagrams published in current technical journals.

Thor Hultgren, "Cyclical Diversities in the Fortunes of Industrial Corporations," *Occasional Paper 32.*

George J. Stigler, "Employment and Compensation in Education," *Occasional Paper 33.*

Arthur F. Burns, "New Facts on Business Cycles," *Thirty-first Annual Report.*

The readers of our publications obtain knowledge of our findings directly. A wider audience is reached indirectly via the citation of results in textbooks, newspapers, magazines, and professional journals. Much of our work has been carried forward by other agencies and individuals; this is, perhaps, the best test of its usefulness. For example, national income estimates, the subject of the first and several subsequent National Bureau volumes, have become an important feature of the statistical work of the Department of Commerce. The Bureau of the Census is extending Fabricant's index of manufacturing output from 1939 to 1947, and the Federal Reserve Board made extensive use of it in revising its own production index. The Board also has carried forward consumer credit and money flow statistics that originated in National Bureau projects.

The National Bureau of Economic Research is entering upon its thirty-first year. It has a broad program of research before it. To carry out this program and place it in the realm of solid achievement requires the cooperation of a large group: those who provide financial support, the Board of Directors, the staff, and last but not least, the economic and statistical profession as a whole.

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The Scatter Chart as a Practical Tool

A Simple Means of Presenting Joint Two-Way Influence

by JOHN V. STURTEVANT

Upon considering the various directions along which the development of practical statistical methods has progressed, it is clear that the search for the causes of observed effects is among the foremost of the statistician's endeavors. In view of the remarkable results which have been achieved through the application of methods such as the analysis of variance, the rationally sub-grouped control chart, multiple regression and others, it is not surprising to find a widening recognition that an observed effect is usually the result of more than one cause. From the viewpoint of those who are familiar with the mathematical aspects of these methods, their multiple-cause results are understandable and, therefore, believable. It appears important, however, that in presenting his results, the statistician should give greater consideration to the viewpoint of his readers who often are unfamiliar with the mathematics involved in these methods and therefore tend to review such results with a somewhat justified skepticism. The likelihood of a favorable reception of statistical results on the part of this important group will certainly be enhanced if the presentation is made in such form as to permit the non-statistician to *see* the "cause-and-effect" relationship without going through the mathematical manipulations.

The scatter chart constitutes one of the more useful of these "direct" methods of presentation. It is frequently applicable where it is desired to present the joint effect of two causes on a result capable of description on the "go-no go" basis.

An example of the use of this method is that of a merchandising chart whose horizontal and vertical axes are scaled

TOTAL COUNT/COUNT OF "DEFECTIVES"

Above Dashed Lines..... 34/34.....100%
Between Solid and Dashed Lines.....110/47..... 43%
Remaining Region of Chart.....565/87..... 15%

DISCRETE CAUSES BY LETTER	5	10	15	20	25	30	35	40	45	50	55	60
K		9/1		10/2			6/6	4/4	5/5		3/3	2/2
J	6/1		11/2	4/1		9/3			4/4		5/5	
I			14/2		11/3		13/5	12/5	14/6		2/2	3/3
H	1/0	7/1	5/1	6/0		15/4	12/3		11/5	12/7	6/3	4/2
G			18/4			17/2		11/3	13/5	11/4		5/2
F	4/0	8/1	14/3		13/2		16/3			7/0	9/1	
E		10/2	8/2	12/2	10/0	13/1	11/3			8/1		4/0
D	6/0	1/0		9/1	13/2	10/2	16/3	16/3			11/2	
C	4/1		8/1	7/1		10/0			11/1	7/0	8/1	5/0
B		6/1		2/0	8/1		7/2	12/2			9/1	
A	6/1	7/1	11/2		10/1		14/3	7/0		8/0		12/3

MID - POINTS OF CONTIGUOUS MEASUREMENT INTERVALS

with selling price and display location, respectively. If then, the desirabilities of the various "combinations" of these two influencing variables are judged by noting the frequencies with which their rates of turn-over exceed some chosen minimum, the scatter-chart constitutes a simple and direct means for showing the joint effects of these two variables. As an example in the technical field, this type of chart is used in presenting the relative frequencies with which various combinations of pressure and temperature, as respectively scaled on the two chart axes, produce densities less than desired.

Owing to its two-way form, as seen in the figure below, the scatter chart can quickly bring out the existence of certain regions which are to be avoided in the interest of quality improvement. One should not infer that this scatter method of presentation can be generally used as a direct substitute for those of a more mathematical nature. It does, however, possess two important advantages in that dependence upon a mathematical model is avoided and the reader is provided with the opportunity of directly and quickly reviewing the statistician's conclusions. Such participation by the reader often helps in securing a favorable reception.

When preparing the scatter chart in its most simple design, it is customary to scale the two influencing variables on the abscissa and ordinate, respectively, in such manner that each variable is expressed as a series of either contiguous numerical intervals or discrete causes. In the spaces formed by the intersecting of the resulting columns and rows, the frequencies of "good" or "bad" items can be indicated, as in the chart below, by showing the total frequency at the left and the frequency of "bad" items at the right. When the data are presented in this manner, the reader is in a position, not only to make a quick comparison of the proportions of undesirable items, but also to gauge their relative significances on the basis of the total number of items found in each of the rectangular spaces.

In order to arrive at some practical conclusion, it is nearly always necessary to find and point out some region of the chart whose quality clearly differs from that of the remaining portion. A very conservative procedure for outlining such a region is to draw a line connecting the outermost spaces exhibiting any "good" items. Those regions or combinations of the two variables thus excluded are automatically indicated as being of either an undesirable or unknown quality. A less conservative and more realistic approach would be to use a line joining the outermost spaces showing more than a chosen minimum frequency of "bad" items (see chart). Another procedure sometimes helpful is to search out and demarcate the "good" or "bad" regions which often occur as rectangles or in the shape of an "L" or "T." The chart might also be explored to learn whether a curved line can be used to separate a desirable area from one of significantly lower quality.

Having located a region of the chart which differs significantly in its quality, it is often helpful to the reader if the chartist presents that portion in color. A striking effect can often be achieved by suitably coloring the white lines of a pertinent area of a Photostat negative of the chart. Owing to the possibility of color-blindness on the part of the reader, it is suggested that complete dependence on color to provide emphasis be avoided.

NEWS about MEMBERS

A **Abraham Aidenoff,** formerly with the Census Bureau, has joined the staff of the Statistical Office of the United Nations as Statistical Consultant for the Far East.

R. G. D. Allen has been elected a member of the International Statistical Institute.

B **W. H. Belz** has been elected a member of the International Statistical Institute.

A. L. Bowley, honorary member of the Association, was included in the Honors List of January 1950, granted the title of "Knight."

C **H. Campion** has been elected a member of the International Statistical Institute.

D **W. E. Deming** has been elected a member of the International Statistical Institute.

J. B. D. Derksen of the Statistical Office of the United Nations will spend two months in Brazil acting as statistical consultant to the Government in the field of national income.

G **E. J. Gumbel** has been appointed consultant to the National Bureau of Standards.

H **H. M. J. Hart,** former head of the Indonesian Bureau of Statistics, is now in Burma acting as statistical consultant to the Government. He has taken over the duties exercised by Mr. Aidenoff from October 1949 to February 1950.

Bradford Hill has been elected a member of the International Statistical Institute.

K **M. G. Kendall** has been elected a member of the International Statistical Institute.

L **William R. Leonard,** who has been acting Director of the Statistical Office of the United Nations, has been named Director.

B. A. Liu, formerly of the Statistical Office of the United Nations, has joined the staff of UNESCO as chief of the Statistics Service. He took up his duties in Paris at the beginning of April.

M **J. Marschak** has been elected a member of the International Statistical Institute.

N **J. Newman** has been elected a member of the International Statistical Institute.

R **Joseph S. Rhodes** has left the position of Mathematical Statistician, Population Division, Bureau of the Census and has accepted that of Statistician, Planning Research Division, Office of the Comptroller, United States Air Force to work on the mathematical and statistical problems of Linear Programming and Interindustry Economics.

S **J. R. N. Stone** has been elected a member of the International Statistical Institutte.

U **Melville J. Ulmer** is on leave of absence from the office of Business Economics, U. S. Department of Commerce, to serve as visiting professor of economics during the summer session at Mexico City College.

V **Ricardo Luna Vegas,** of the Statistical Office of the United Nations, has spent six months visiting Argentina, Bolivia, Brazil, Chile, Guatemala, Paraguay, Peru and Uruguay. The purpose of his visit to these countries has been to give advice and assistance in the preparatory plans of these countries in connection with the forthcoming censuses of population which are to take place during 1950 and 1951. Mr. Luna Vegas will return to Latin America in the near future to give further assistance in arrangements for the censuses in Paraguay and Bolivia.

W **Abraham Wald,** Chairman, Department of Mathematical Statistics, Columbia University, gave a series of lectures on the theory of statistical decision functions at the Naval Ordnance Test Station, April 3-7, 1950. Representatives from several organizations and educational institutions on the Pacific Coast attended the lectures.

J. Wold has been elected a member of the International Statistical Institute.

Y **G. Udny Yule,** honorary member of the American Statistical Association, has been elected to honorary membership in the International Statistical Institute.

CHAPTER NOTES

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CENTRAL INDIANA

Irving Burr of Purdue University, retiring president of the Indiana Chapter, spoke at the May dinner meeting on "The Industrial Statistician's Kit of Tools."

The second discussion in a seminar on time series was conducted during coffee hour which preceded the dinner. Problems in time series encountered in actual practice were presented by John Hanson of Eli Lilly and Company, and Dwight Kelley of Indiana Employment Security Division.

The following officers were elected for the next year: President, Roy Adams, Indiana State Department of Public Welfare; First Vice-President, Dwight Kelley, Indiana Employment Security Division; Second Vice-President, Carl Kossack, Purdue University; Secretary-Treasurer, Lucy Kantz, Indiana Employment Security Division.

CENTRAL NEW JERSEY

The May 10th meeting was addressed by Dr. Nathaniel Cherniack, Economist for the Port of New York Authority, who spoke on statistical problems in connection with traffic analysis.

Officers for the coming year are: Chapter President, Dr. Joseph Hochstim, Chief Statistician, Opinion Research Corporation, Princeton; Vice-President, Dr. Wilbert E. Moore, Associate Professor of Sociology, Princeton University; Secretary-Treasurer and Assistant Secretary, William Netschert, Jr., and Miss Mary McKallen, both of the New Jersey Division of Employment Security.

CONNECTICUT

The March meeting dealt with "The Measurement of Utility," with Professor Frederick Mosteller, of the Laboratory of Social Relations, at Harvard University, as speaker.

The May meeting dealt with "Statistics in Operations Research." Professor S. S. Wilks, President of the American Statistical Association, was the speaker.

DENVER

The following persons were elected officers of the Denver Chapter for the 1950-1951 chapter year at the annual meeting held May 11, 1950: President, Edward C. Bryant, University of Wyoming; 1st Vice-President, Robert S. Motika, The Mountain States Telephone and Telegraph Company; 2nd Vice-President, John Clark Coe, Monarch Air Lines, Inc.; Secretary-Treasurer, Myrtle R. Humiston, Teacher-Byers Junior High School.

The Metropolitan Statistical Society, Collegiate Division, held a conference on job opportunities for statisticians on April 17. The program included:

Speakers on Opportunities in: 1. Government—Mr. Robert R. Behlow, Regional Director, Bureau of Labor Statistics, N. Y. C.; 2. Industry and Management Statistics—Prof. William A. MacCrehan, Jr., Director of Gage Laboratory, New York University; 3. Education—Dr. Helen M. Walker, Professor of Education, Columbia University; 4. Vital and Scientific Statistics—Dr. E. Cuyler Hammond, Director Statistical Research Section, American Cancer Society; 5. Marketing and Public Opinion Research—Mr. Solomon Dutka, Statistician with Elmo Roper; Panel Discussion—Mr. Robert R. Behlow, Prof. William A. MacCrehan, Jr., Dr. Helen M. Walker, Dr. E. Cuyler Hammond, Mr. Solomon Dutka.

The New York Chapter ended the Spring season in a blaze of glory, so to speak. In the belief that a forecast for the second half of 1950 would be too tame, New York forecasters went out on a limb with predictions for 1951, at the Spring Forum dinner which was held on May 25 at the Columbia University Club. Leo Barnes, Chief Economist, Prentice-Hall, Inc., and Harold B. Dorsey, President, Angus Research Corp., gazed into their crystal balls, while Robert W. Burgess, Chief Economist, Western Electric Co., Inc., presided. Among the speakers from the floor was Ernest W. Holden, President of F. W. Dodge Corp.

Dr. Barnes and Mr. Dorsey seemed to agree that inventory spending would last through the third quarter, but would taper off in the fourth quarter of 1950 and maybe the decline would extend into 1951. Dr. Barnes was soberly optimistic about 1951, which he thought would be a very good year, and surely not bad. Mr. Dorsey was of the opinion that inventory accumulation was more important than most people thought, and had a stronger effect on the business cycle. For this reason, business in 1951 would not be so good as this year, although not off to any great extent.

The Statistical Techniques Division was as active as usual, and presented a series of interesting programs. Perhaps the highlight of the season was the talk by Norbert Wiener of the Massachusetts Institute of Technology on "Time Series." Dr. Wiener said, "A statistical series is good only so long as the statistical basis remains the same. In a rapidly changing society, with social and economic changes, there will be only an illusion of accuracy."

Other speakers on the program of this Division were S. B. Littauer, Department of Industrial Engineering, Columbia University, who spoke on "Statistical and Quality Control Aspects of Time Studies"; Ida Rhodes, National Bureau of Standards, whose subject was "Planning the Work for Electronics Computing Machines"; and Abraham Wald, Department of Mathematical Statistics, Columbia University, who presented a paper on "Principles of Statistical Decisions."

The Social Statistics Division sponsored a meeting on May 4, at which there was a discussion of the "Consumers Price Index—Its Construction, Uses and Qualifications." The speakers were Robert R. Behlow, Regional Director of the U. S. B. L. S., and Lazare Teper, Research Director of the I. L. G. W. U. Informal discussion from the floor followed the meeting.

PHILADELPHIA

The April meeting was addressed by Dr. Clair Wilcox, who spoke on the present status of the International Trade Organization.

The May meeting was addressed by Ewan Clague, Commissioner of the U. S. Bureau of Labor Statistics, who spoke on "Measuring Some Policies Governing Full Employment."

ST. LOUIS

The March meeting elected the following officers:

Vice-President in Charge of Program—Dr. Werner Hochwald; Secretary—Dr. Edward B. Olds; Treasurer—Mrs. Katherine Grimm.

The May meeting was devoted to a panel discussion on "Let Statistics do it—Better"; "Why and Whither Quality Control"; "Statistics' Merchandise Fair—and the Buyers"; and "Making Friends and Influencing People the Hard Way."

The panel discussion was led by James H. Batchelor, Management Consultant; and the speakers included Mason E. Westcott, Editor-in-Chief of Industrial Quality Control; W. A. Vezeau, Professor of Mathematics and Head of the Department of Statistics at St. Louis University; and Paul Rider, Professor of Mathematics at Washington University.

WASHINGTON

The April meeting was devoted to a discussion of the statistical programs of the National Institutes of Health and statistical problems in measuring illness. George Perrott, of the U. S. Public Health Service, presided, and the speakers were:

Harold F. Dorn, U. S. Public Health Service; Theodore D. Woolsey, U. S. Public Health Service.

Officers for 1950-51 are: President, Ezra Glaser; Vice-President, Gertrude Bancroft; Secretary-Treasurer, Margaret Gurney.